LYs and $271.3 billion (B) due to cervical cancer alone over the next 20 years. Based on a realistic linear investment model, RT yields an additional 9.8M LYs (2.9M in LIC, 4.7M in LMIC, and 2.2M in UMIC) over 20 years, a $53.2B net increase in economic productivity ($2.6B in LIC, $16.4B in LMIC, and $34.2B in UMIC), and a broader societal net gain of $137.5B ($10.3B in LIC, $44.8B in LMIC, and $82.4B in UMIC). The additional investment necessary for HDR brachytherapy, an essential component of curative treatment, was only 5.5% greater than EBRT alone. **Conclusions:** The failure to ensure global availability of EBRT and BT to treat cervical cancer would result in enormous human and economic consequences over the next two decades. This loss would occur before the benefits of primary cancer prevention strategies, such as HPV vaccination, are realized. The present study demonstrates that a realistic investment strategy over the next 20 years may yield a net economic benefit of up to $150B USD, and potentially further benefits beyond that point in time. These findings support the value of scaling-up of EBRT and BT to treat cervical cancer and help to justify their inclusion in national cancer control planning.

12

UTILIZATION OF EMERGENCY DEPARTMENTS AMONG PATIENTS WITH CANCER

Harvey Quon[1], Mark Smith[2], Lisa Lix[2], Jane Griffith[1], Heather Prior[2], Say Hong[2], Ankona Banerjee[2], Ina Koseva[2], Christina Kulbaba[2]
[1]CancerCare Manitoba, Winnipeg, MB
[2]Manitoba Centre for Health Policy, Winnipeg, MB

Purpose: To compare emergency department (ED) use between patients with cancer and a matched cancer-free cohort of individuals and to examine the association between ED use and time to death.
Methods and Materials: Data were from the Manitoba Centre for Health Policy Data Repository and included cancer registry, hospital discharge abstracts, physician billing claims, ED visits, and vital statistics. The cancer cohort included adults (age 18+) with selected cancer diagnoses (breast, colorectal, lung and prostate) made between 2007 and 2011. Rates of ED utilization were compared during three time periods (pre-, peri-, and post-diagnosis) using generalized estimating equations between cancer patients and cancer-free individuals matched 1:1 on age, sex, and Charlson comorbidity score. The association between ED use and time to death was tested using a multivariable Cox proportional hazards regression model.
Results: A total of 5569 patients with breast (n = 1555), colorectal (n = 1327), lung (n = 1437), and prostate (n = 1250) cancer were included. When comparing ED utilization between cancer cases by site and their matches only lung cancer showed a significant increase during the pre-diagnosis period (relative rate [RR] 1.38 [95% confidence interval 1.18-1.62], p < 0.0001). ED utilization was increased during the peri-diagnosis period for breast (RR 1.74 [1.31-2.32], p = 0.0001), colorectal (RR 2.44 [1.72-3.45], p < 0.0001), lung (RR 4.51 [3.61-5.63], p < 0.0001), and prostate (RR 3.10 [2.14-4.47], p < 0.0001) cancer. In the post-diagnosis period, ED utilization was increased for breast (RR 1.45 [1.26-1.67], p < 0.0001), colorectal (RR 1.40 [1.11-1.76, p = 0.0005), and lung (RR 2.28 [1.94-2.67], p < 0.0001) cancer. ED use in the year prior to diagnosis was associated with time to death for prostate cancer (hazard ratio [HR] 1.12 [95% CI 1.02-1.24], p < 0.02) while ED use in the post-diagnosis period was associated with time to death for breast (HR 1.27 [1.18-1.37], p < 0.0001), colorectal (HR 1.11 [1.04-1.18], p = 0.0012), and lung (HR 1.10 [1.06-1.14], p < 0.0001) cancer.
Conclusions: The pattern of ED utilization varies with cancer site and time from diagnosis. All cancer sites were associated with increased ED use around the time of diagnosis, while patients with breast, colorectal, and lung cancers also showed increased ED use in the post-diagnosis period. Additional cancer-related urgent care services during the peri- and post-diagnosis periods may alleviate the frequency of ED visits among patients with cancer.

13

POST-OPERATIVE "MINIPELVIS" RADIOTHERAPY WITH OR WITHOUT VAGINAL VAULT BRACHYTHERAPY BOOST FOR STAGE II ENDOMETRIAL CANCER

Kim Paulson, Natalie Logie, Fleur Huang, Robert Pearcey, Sunita Ghosh, Brad Murray, Geetha Menon, Ericka Wiebe
University of Alberta, Edmonton, AB

Purpose: Patients with FIGO Stage II endometrial cancer (EC) are generally treated surgically, with risk-adapted adjuvant radiotherapy (external beam radiotherapy (EBRT) and/or vaginal vault brachytherapy (BT) boost) still suboptimally defined. With changing surgical practices in nodal assessment and/or resection, opportunity exists for selected patients to receive less intensive adjuvant therapy, with the goal of lessening treatment-related morbidity. In this single-institutional review, we explore outcomes of Stage II EC patients treated with adjuvant "minipelvis" (MP)-EBRT (a field covering at least the surgical bed, vaginal vault, and parametria, but not the classical elective nodal regions) +/- BT.
Methods: Women with pathologic Stage II EC receiving post-operative MP-EBRT from 2000 onwards were reviewed. Demographics, disease characteristics, treatment details, survival, and recurrence data were collected. Three-year relapse-free survival (RFS) and overall survival (OS) were calculated from the date of surgery (Kaplan-Meier method). Median RFS and OS were compared between those receiving MP-EBRT+BT and those receiving MP-EBRT alone (log rank test). Univariate analysis was performed (binary logistic regression) to determine factors associated with relapse.
Results: n = 42 patients (median age 63 years [36-86]) received adjuvant MP-EBRT (2000-2015), with median follow up 27 months (2-105). n = 37 (88%) had pelvic lymph node dissection. Endometrioid adenocarcinoma was predominant (71%) over other histologies. n = 20 had Grade 3 disease, n = 18 had deep (> 50%) myometrial invasion (MI), and n = 22 had lymphovascular invasion (LVI). n = 10 received adjuvant chemotherapy. MP-EBRT fields had conventional inferior and lateral borders and height less than 12 cm (range 7.8-11.8). Dose fractionation was typically 45 Gy in 25 fractions (40-52.6 Gy/20-25), and 32 (76%) received subsequent HDR BT boost, typically 15 Gy in three fractions (15-18 Gy/3) prescribed to vaginal surface. Ten patients relapsed (one vaginal recurrence, three in pelvis outside the field, six distant), four (40%) of those not receiving BT versus 19% of the BT group (OR 3.5, 95%CI 0.7-16.9, p = 0.125). Median time to relapse was 20 months (10-32). Tumour grade, LVI, and MI were not significantly associated with relapse. Three-year RFS and OS were 74% and 92% respectively.
Conclusions: In this small series, early outcomes following adjuvant MP-EBRT for Stage II EC align with those reported for conventional adjuvant EBRT, suggesting that this is a reasonable approach. Only three patients relapsed in the pelvis outside of the field. Further characterization of tumour and toxicity outcomes can help to better define the population most likely to benefit from MP-EBRT, and the value of BT boost in this setting.

14

CURRENT PRACTICE OF BRACHYTHERAPY AND EXTERNAL BEAM RADIOTHERAPY FOR CERVICAL CANCER IN ONTARIO, CANADA

Negin Shahid[1], Timothy Craig[1], Mary Westerland[2], Allison Ashworth[2], Michelle Ang[3], David D'Souza[4], Raxa Sankreacha[5], Anthony Fyles[1], Michael Milosevic[1], Iwa Kong[6]
[1]University of Toronto, Toronto, ON
[2]Cancer Centre of Southeastern Ontario, Kingston, ON
[3]Cancer Care Ontario, Toronto, ON
[4]University of Western Ontario, London, ON
[5]Trillium Health Partners, Mississauga, ON
[6]McMaster University, Hamilton, ON

Purpose: To document the practice of brachytherapy (BT) and external beam radiotherapy (EBRT) for management of cervical cancer across Ontario, Canada with a population of 13.6 million.
Methods and Materials: An electronic survey (SurveyMonkey)

was sent to all 14 provincial cancer centres in 2013. The survey included 72 questions in four different categories: general/demographic, pre-treatment assessment, EBRT and BT questions.

Results: The response rate was 100%. Ten out of 14 centres treated cervical cancer patients and had a dedicated brachytherapy suite. All 10 centres that treated cervix cancer had a peer review process for quality assurance (QA). Nine centres had written treatment planning and delivery protocol and five centres used a specific plan evaluation protocol for organs at risk for EBRT. The standard EBRT technique was 4-field box in eight centres and one centre used IMRT if treating the para-aortic nodes simultaneously; one centre did not respond. The dose/fractionation scheme to the whole pelvis was 45-50 Gy in 1.8-2 Gy per fraction in all but one centre. Nine centres used image verification at some point during EBRT. All ten centres used HDR brachytherapy and one centre also used PDR brachytherapy to treat cervix cancer patients.

Brachytherapy was performed under general anesthesia, regional anesthesia and conscious sedation in four, one and five centres, respectively. Only one centre offered interstitial brachytherapy. The majority of centres (eight of 10) used ultrasound image guidance for intrauterine applicator insertion. For treatment planning two centres used CT and MRI, four centres used CT only and four centres used orthogonal x-rays. GEC-ESTRO guidelines were used in three centres for target volume delineation and in five centres for organs at risk (OAR) dose constraints. Nine centres prescribed and reported dose to Point A. Volumetric dose prescription was performed in one centre and four centres reported dose to a target volume. Eight centres reported dose to OARs. The number of BT applicator insertions varied significantly between the centres ranging from one to six. The dose prescription was also variable ranging from 5.5 Gy to 8 Gy per fraction.

Conclusions: The main findings from the survey were the variation in the BT dose fractionation and treatment planning used in the regional cancer centres while there was a general uniformity in peer reviewed QA, written institutional treatment protocol, EBRT technique, dose fractionation scheme and use of HDR BT across the province. This study shed light on the need to implement a harmonized evidence-based brachytherapy practice for cervical cancer in order to improve patients' outcome across Ontario, Canada.

15

FEASIBILITY OF COLLECTING PATIENT REPORTED OUTCOMES FOR PATIENTS RECEIVING CURATIVE INTENT RT FOR GYNECOLOGICAL MALIGNANCIES

Robert Olson[1], Caroline Holloway[2], Christina Parson[3], Peter Lim[2], Vincent Lapointe[4], Sheri Lomas[4], Gale Bowering[5], Francois Bachand[6]

[1]British Columbia Cancer Agency - Centre for the North, Prince George, BC
[2]University of British Columbia, Victoria, BC
[3]University of British Columbia, Vancouver, BC
[4]British Columbia Cancer Agency, Vancouver, BC
[5]British Columbia Cancer Agency, Abbotsford, BC
[6]University of British Columbia, Kelowna, BC

Purpose: The British Columbia Cancer Agency radiotherapy (RT) program started the Prospective Outcomes and Support Initiative (POSI) at all six centres in 2013 to collect and utilize patient reported outcomes (PROs) for patients receiving palliative intent RT. In 2015 it expanded to patients receiving curative intent RT, starting with the gynecological (gyne) tumour group. We sought to describe the success in expanding to non-palliative sites.

Methods and Materials: Five validated questionnaires, the EPIC Bowel 2 (2002), EPIC Urinary 2 (2002), PRO-CTAE GI toxicity, EORTC QLQ CX24, and the EQ5DL were selected as the PROs of interest by the gyne tumour group. The questionnaires were converted to tablet format, and data was entered directly by patients via tablet at time of RT, and each subsequent follow up (FU). Some centres choose to also administer the questions weekly during RT, which is categorized as FU below in comparing scores to baseline. The results of the questionnaires were made available immediately to Radiation Oncologists, viewable in the RT electronic medical record, and in a local intranet POSI Portal. Descriptive Statistics were used to present accrual data and results of the PRO questionnaires.

Results: From March 2015 to January 2016, 480 gyne patients were approached by POSI on 1007 occasions (i.e. baseline, on treatment, or FU), with a 97% response rate. However, not all six British Columbia Cancer Agency centres participated at that time, with Vancouver and Victoria starting in March, Abbotsford in July, Kelowna in August, while Surrey and Prince George have not yet participated. The mean (and standard deviation) scores of the EPIC Bowel, EPIC Urinary, PRO-CTAE GI, EORTC QLQ CX24, and EQ5DL were 8.9 (9.4), 6.1 (7.3), 2.9 (3.4), 2.8 (3.5), and 8.8 (3.2), respectively, with significantly ($p < 0.05$) worse scores at FU compared to baseline for each questionnaire, except the EQ5DL ($p = 0.62$). Of the 24 patients not accrued, 29% were unfit, 21% had not interpreter available, and 50% declined. Among those who declined, 33% did at baseline, 17% at first repeat measure, 25% at second, and 25% at the third or later repeat measure. Among the 189 patients who reported PRO on more than one time interval, 72, 37, and 80 patients repeated the PRO 2,3, and > 3 occasions respectively to date.

Conclusions: Expansion of POSI to collect PRO in a radical tumour group appears feasible, though there have been barriers to expansion to all six British Columbia Cancer Agency centres, which will be explored. Despite the use of five validated questionnaires totaling 49 questions, the accrual rate is exceptional, and appears feasible weekly during radiotherapy. Expansion to other radical tumour sites will be used to test if these results are reproducible. Future plans are to test the impact of providing PRO data to clinicians, and to make gyne PRO data available for research and quality improvement initiatives.

16

DO YOUNG WOMEN BENEFIT FROM BREAST BOOST RADIOTHERAPY IN THE HORMONE THERAPY ERA?

Laura Beaton[1], Elisa Chan[2], Scott Tyldesley[2], Lovedeep Gondara[2], Caroline Speers[2], Alan Nichol[2]

[1]University of British Columbia, Vancouver, BC
[2]British Columbia Cancer Agency, Vancouver, BC

Purpose: The EORTC 22881 boost trial showed a substantial benefit of delivering a radiotherapy boost to the tumour bed (RTB) in women aged 40 years and younger, with an improvement in 10-year local relapse-free survival (LRFS) of 10%. However, this trial was carried out in an era where pre-menopausal women did not receive adjuvant hormone therapy (HT). We sought to determine how the use of HT and RTB changed in a population-based cancer care program in response to new practice guidelines, and whether this had an impact on LRFS. We also set out to determine whether the anticipated benefit of a RTB for young women was observed in the era of routine HT.

Methods and Materials: A provincial database was used to identify all women 40 years and younger with breast cancer that met the inclusion criteria of the EORTC 22881 trial: treated with whole breast radiotherapy after breast conserving surgery, margin negative (not at ink), and Stage I and II. The percentages of women receiving HT and RTB were compared across three Eras that were defined, a priori, with a three-month delay allowing for implementation of the practice changes: Era 1 (pre-HT, pre-boost) January 1996-September 1998; Era 2 (HT, pre-boost) January 1999 - September 2001; Era 3 (HT and boost) January 2002 - September 2004. LRFS was calculated using the Kaplan-Meier method and the three eras compared using a log rank test. Factors significant at < 0.3 on univariate analysis were included with Era in a multivariable (MVA) Cox model.

Results: The study included 411 patients: 130 in Era 1, 142 in Era 2, and 139 in Era 3. The use of adjuvant HT increased over time, with 8% use in Era 1, 45% in Era 2 and 54% in Era 3 ($p = < 0.001$) For estrogen receptor (ER) positive cancers, HT use was higher: 13% in Era 1, 68% in Era 2 and 82% in Era 3 ($p = < 0.0001$). The